

**Alan G. MacDiarmid and Lockheed Martin Aeronautics of Fort Worth, Texas: A
Regional Technological, Economic and Intellectual Powerhouse**
March 30, 2004

Da Hsuan Feng
Vice President for Research and Graduate Education
The University of Texas at Dallas

On March 30, 2004, the Office of the Vice President of Engineering and Senior Technical Fellows of Lockheed Martin Aeronautics Company (LMAC) in Fort Worth, Texas, hosted UTD's James Von Ehr Distinguished Chair in Science and Technology and Y2K Nobel laureate in Chemistry, Professor Alan G. MacDiarmid to deliver a lecture entitled "Electronic Polymers: New Materials for the 21st Century." The lecture took place in the afternoon (between 1:15 – 3:30 pm) in the company's Aeronautics Visitor Center Auditorium.

Besides the always exciting presentation by Alan, which attracted over 100 senior/junior technical staff members of this technological and economic powerhouse, some of them coming as far as LMAC's Marietta Georgia facility and Palmdale, California facility, there were also

- (a) A morning session in which Tom Ghesquiere, LMAC's Manager of the Aeronautics Visitor Center gave an overview of the company in general, and the Fort Worth campus in particular, and Da Hsuan Feng, Vice President for Research and Graduate Education of UTD gave an overview of UTD.
- (b) A tour of the mile long (actually mile + 50 feet long, to be exact) production facility of LMAC in which a large percentage of the world's 4200 F-16 fighter planes were manufactured. This floor facility also is in the process of becoming the manufacturing center of the JSF.
- (c) A meeting with a manufacturing research center in the facility.
- (d) A great Texas barbecue lunch for the guests and senior management and technical staff of LMAC (in which there were significant but very informal drill-down technical discussions took place)
- (e) Last but not least, an hour long (and it could be a lot longer if everyone could have stayed longer) discussion as to how UTD and LMAC can proceed to collaborate in different areas.

The event was initiated and planned by Dr. Charles S. Liang, LMAC's Senior Technical Fellow, Signature Management and Survivability. I have to say that I am greatly impressed by the spectacular pre-planning and execution of the event. During an unrelated visit to LMAC the week before with many UTD faculty members, we noticed

that at every corner of this massive campus there was a well-designed poster depicting Alan's affiliation as well as the title and abstract of his talk.

I also am pleased to notice that one of UTD's Research Advisory Board members, Amand Chaput, also had a palpable role in our visit.

Accompanying Alan from UTD to this day-long event were:

Da Hsuan Feng, Vice President for Research and Graduate Education

Hasan Pirkul, Dean of the School of Management

David Springate, Associate Dean of the School of Management

D. J. Yang, Professor of Chemistry

Michael J. Savoie, Director of the Center for Information Technology and Management (CITM) in the School of Management

People who were acting as hosts (at least those who gave me business cards) were:

R. W. Manney, Vice President, Deputy for Engineering

William B. Anderson, Vice President, Customer Support

David J. Chellman, Senior Technical Fellow, Airframe design Metallic Materials

David. Sundstrom, Senior Technical Fellow, Systems and Software Integration

Gordon F. Gibson, Technical Fellow – Conceptual Design, Advanced Development Program

Mary P. Reagor, Engineering Staff Specialist/Systems Software and L.M. Aero Technical Fellow

Charles S. Liang, Senior Technical Fellow, Signature Management and Survivability

John E. Weaver, Technical Fellow, Mission Systems and Avionics

Tom Ghesquiere, Manager, Aeronautics Visitor Center

H. Mei Graham, Physicist, Senior Staff,

I know I have left out quite a number of individuals who were very hospitable to us.

And the hospitality was superb.

Something about JSF and LMAC

About a year ago, LMAC blinked brightly on the national radar screen when it was awarded the "Joint Strike Fighter" (JSF) Program by the Department of Defense. This is a multi-year, multi-billion dollar – it is touted to be an over two decades and \$300 billion – program. The aim of the JSF program is to replace and standardize the fighter planes of over 22 nations, especially the three services of DoD -- the Air Force (the F-16's, manufactured by Lockheed), Navy (F-18's, manufactured by Boeing) and the Marines (AV-8B Harrier, British designed and manufactured by Boeing).

Although the program was only initiated about a year ago, its impact on the company, the Metroplex and the nation can already be felt. In the last 12 months, I have the pleasure of visiting the campus four times, and each time, I can sense the "rising" of the JSF

program. In fact, in October of 2003, Tom Burbage, Executive Vice President and Program Manager of the JSF came to UTD and delivered a well-received talk entitled “The Impact of the Joint Strike Fighter (JSF) Project on the Dallas Community.”

I also learned in this trip that the JSF project has initiated a “hiring binge” of scientists, engineers, technologists, management experts, supply chain experts. The JSF is imposing new paradigms in the design and the manufacturing on LMAC, which

- (1) The JSF aircraft design is “forcing” a new manufacturing paradigm. For example, there are more “unit pieces” (components without holes) than the F-16’s and the way these unit pieces were constructed require new ways of manufacturing. Since the JSF will be constructed on the same floor shop as the F-16, a great deal of redesigning needs to be carried out. Certainly in going down the one mile stretch of the floor shop, I could see that there was a great deal of “re-engineering” going on.
- (2) The JSF is stealthy, unlike the F-16. Stealth technology is not new. In fact, the most successful stealth fighter, the F-117 was designed and manufactured nearly 2 decades ago. It was also extensively deployed in the past several conflicts. I learned that stealthy capability places a great deal of constraint on the aircraft shape and therefore the F-117 has an unusual outlook. However, in the past two decades, with significant improvement in stealth technology and new materials online for aircraft deployment, the stealthy JSF can look more like the F-16 than the F-117.
- (3) What is particularly impressive for me is that “hidden” in this facility of LMAC, there is enormous high level technical expertise. In particular, it was made clear to us that confronting this industry are enormous technical, human factor and program managerial challenges. No doubt, given enough time and resources, many, if not all, of these challenges can and will be solved in-house in LMAC. However, I was very excited to learn that there seems to be a real desire within the LMAC community of wanting to find the right collaborative mode between universities and this industry to face these challenges. I am confident that such collaborations, if they can be instituted, will have incredible economic and intellectual impact for the region, even beyond what the JSF has had already.

Epilogue

I mentioned in my talk in the morning that 21st century aerospace is not just about aerodynamics. It is about:

- Avionics
- Materials (composites and new materials)
- (Wireless) communications
- Command and control (logistics and supply chain)
- System integration
- Human factor research
- Research on biological systems under extreme conditions

- More, and much much more.

The solutions of these problems require multi-disciplinary and group collaboration approaches.

As a university with the vision of becoming an intellectual and economic engine for the Metroplex, I believe that it is critical that we seek ways to work with the aerospace industry in our region.

The future, in fact, the near future, is very exciting indeed!